

1. An apparatus for multiplexing with variable grades of service to independent channels, the apparatus comprising:

first and second lasers;

first and second digital data signals;

5 first and second photonic modulators configured to modulate the first and second lasers with the first and second digital data signals, providing first and second modulated photonic signals;

first and second delay mechanisms configured to provide delayed copies of the first and second modulated photonic signals, delayed by first and second delays, respectively;

combiners configured to combine the delayed copies with the first and second modulated signals to form first and second consolidated modulated signals, respectively; and

a control module configured to adjust the power of the first and second consolidated signals by first and second weights, respectively, corresponding to the quality of service required by first and second users.

10 15 20
2. The apparatus of claim 1, further comprising a multiplexing combiner configured to combine the first and second consolidated modulated signals.

3. The apparatus of claim 2, further comprising an output line configured to transmit the multiplexed output toward a destination over a carrier medium.

4. The apparatus of claim 3, further comprising a splitter located at the destination and configured to receive from the carrier medium and split the multiplexed output into first and second daughter signals.

5. The apparatus of claim 4, further comprising third and fourth delay mechanisms configured to provide first and second delayed copies of the first and second daughter signals, delayed by the first and second delays, respectively.

6. The apparatus of claim 5, further comprising:

a first detector configured to extract the first digital data signal from the first daughter signal and the first delayed copy; and

second detector configured to extract the second digital data signal from the second daughter signal and the second delayed copy.

7. The apparatus of claim 6, wherein the carrier medium is an optical fiber.

8. The apparatus of claim 7, wherein the first and second modulated photonic signals are encoded using orthogonal codes.

20 9. The apparatus of claim 1, wherein the first and second consolidated modulated signals are combined into a multiplexed output and transmitted across a carrier medium.

5

10. The apparatus of claim 1, further comprising:
 - a multiplexing combiner operably connected to combine the first and second consolidated modulated signals into a multiplexed output; and
 - a splitter, further configured to receive and split the multiplexed output into first and second daughter signals.

11. The apparatus of claim 10, further comprising third and fourth delay mechanisms configured to provide first and second delayed copies of the first and second daughter signals, delayed by the first and second delays, respectively.

一〇〇

12. The apparatus of claim 11, further comprising:
 - a first detector configured to extract the first digital data signal from the first daughter signal and the first delayed copy; and
 - a second detector configured to extract the second digital data signal from the second daughter signal and the second delayed copy.

13. A method for coherence multiplexing providing variable grades-of-service to independent channels, the method comprising:

providing first and second lasers;

providing first and second digital data signals;

5 modulating the first and second lasers with the first and second digital data signals to provide first and second modulated photonic signals;

providing delayed copies of the first and second modulated photonic signals, delayed by first and second delays, respectively, the delayed copies being recombined with the first and second modulated signals to form first and second consolidated modulated signals; and adjusting the power of the first and second consolidated signals by first and second weights, respectively, corresponding to the quality of service required by first and second users, respectively.

14. The method of claim 13, further comprising combining the first and second consolidated modulated signals into a multiplexed output.

15. The method of claim 14, further comprising transmitting the multiplexed output over a carrier medium.

16. The method of claim 15, further comprising splitting the multiplexed output into first and second daughter signals.

20 17. The method of claim 16, further comprising providing first and second delayed copies of the first and second daughter signals, delayed by the first and second delays, respectively.

18. The method of claim 17, further comprising:
extracting the first digital data signal from the first daughter signal and the first delayed copy;
and
extracting the second digital data signal from the second daughter signal and the second
5 delayed copy.

19. The method of claim 18, wherein the carrier medium is an optical fiber.

10 20. The method of claim 19, wherein the first and second modulated photonic signals are
encoded using orthogonal codes.